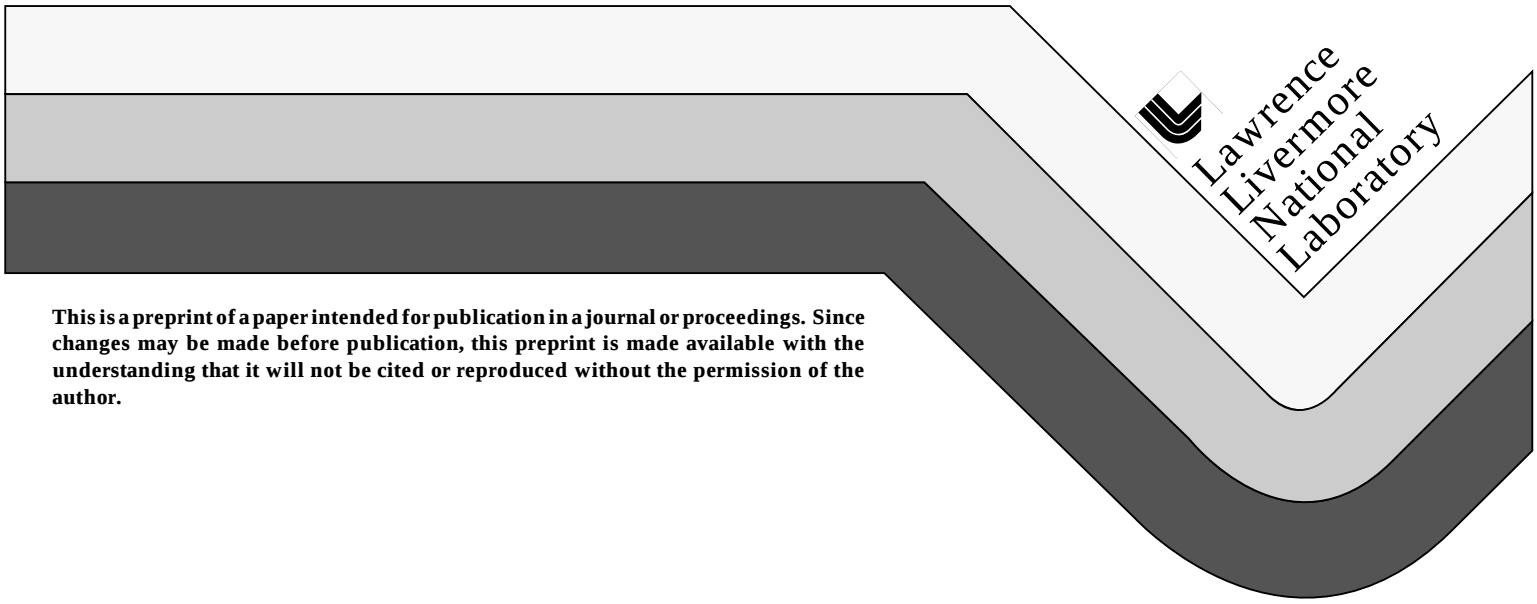
UCRL-JC-118918
PREPRINT

Using an Information System to Meet Hazardous Waste Management Needs

J.J. Stewart, Jr.
R.E. Howe
S.L. Townsend
D.T. Maloy
R.K. Kochhar

This paper was prepared for submittal to the
Third Biennial Mixed Waste Symposium
Baltimore, MD
August 7-11, 1995

February 1995



Using an Information System to Meet Hazardous Waste management Needs

John J. Stewart, Jr., Robert E. Howe, Suzanna L. Townsend, Donna T. Maloy, and Rick K. Kochhar

Lawrence Livermore National Laboratory
P.O. Box 808, L-621
Livermore, California 94551
(510) 423-8589/(510) 422-6082*

University of California

Lawrence Livermore National Laboratory

Environmental Protection Department

USING AN INFORMATION SYSTEM TO MEET HAZARDOUS WASTE MANAGEMENT NEEDS

John J. Stewart, Jr., Robert E. Howe, Suzanna L. Townsend,
Donna T. Maloy, and Rick K. Kochhar

Lawrence Livermore National Laboratory
Hazardous Waste Management Division
P.O. Box 808, L-621, Livermore, CA 94550
(510) 423-8595 / (510) 422-3469*

ABSTRACT

Lawrence Livermore National Laboratory (LLNL) is a large quantity RCRA hazardous waste generator. LLNL also generates low level and transuranic radioactive waste that is managed in accordance with the Department of Energy (DOE) orders. The mixed low level and mixed transuranic waste generated must be managed to comply with both RCRA regulations and DOE orders. LLNL's hazardous and radioactive waste generation is comprised of 900 generators who contribute to nearly two hundred waste streams. LLNL has a permitted EPA treatment and storage (TSD) facility for handling RCRA hazardous waste that is operated by LLNL's Hazardous Waste Management (HWM) division. Radioactive and mixed wastes are also handled at this facility. The generators can store their waste for up to 90 days at some 52 waste accumulation areas (WAA) at LLNL. A generator of hazardous waste must submit a waste disposal requisition for review by HWM before their waste is approved for pickup. Once the requisition is approved, HWM will pickup the waste and bring it into its facility for storage. RCRA waste can be stored for up to one year before it is either shipped for disposal or treated at HWM's aqueous waste treatment farm.

In HWM we have developed an information system, the Total Waste Management System (TWMS), to replace an inadequate "cradle to grave" tracking of all the waste types described above. The first phase of this system became operational at the end of September 1994. The goals of this system are to facilitate the safe handling and storage of these hazardous wastes, provide compliance with the regulations and serve as an informational tool to help HWM manage and dispose of these wastes in a cost effective manner. The key to success in utilizing TWMS is ensuring the accuracy and completeness of the data entered into the system. The information on the requisition is entered into TWMS where it is validated and checked for consistency before the requisition is finally approved. All hazardous wastes that are brought into the HWM facility are in a container with a unique bar-code affixed to them. A bar-code scanner with input capability is used to identify all

transactions performed on a container and/or its waste. This information is downloaded to TWMS at the end of each working day and is checked for consistency. We will describe the TWMS in more detail and discuss the benefit of having a system that is integrated into the various facets of HWM's operations.

Work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract W7405-Eng-48.

Introduction

The Department of Energy, the Environmental Protection Agency, and the State of California require Lawrence Livermore National Laboratory (LLNL) to comply with strictly enforced permitted-capacities for storage of different classes of wastes and to provide cradle-to-grave tracking of these wastes including mandatory state and federal reports. The Hazardous Waste Management (HWM) Division handles the storage and disposition of regulated wastes generated at LLNL. HWM is the focus for implementation of technologies necessary to manage all hazardous, radioactive, and mixed wastes generated at all LLNL facilities. HWM is continually developing and improving methods for managing wastes to assure minimal environmental impact. The Division's responsibilities include investigation of new, innovative, and more cost-effective methodologies for waste handling, stabilization, treatment, disposal, and regulatory compliance. To discharge its waste management responsibilities, HWM Division maintains expertise to:

- Track and document hazardous, radioactive, and mixed wastes for the Livermore Site and Site 300.
- Process, store, package, treat, and prepare waste for shipment to licensed off-site treatment storage, and recycling facilities.
- Ensure that LLNL meets the federal, state, and local regulations regarding the permitting and compliance of HWM facilities.

There are two parts to The Laboratory's waste compliance responsibilities: The actual collection, storage, and disposal of the waste as well as proper preparation of the accompanying paperwork–describing it, verifying it, and recording its whereabouts.

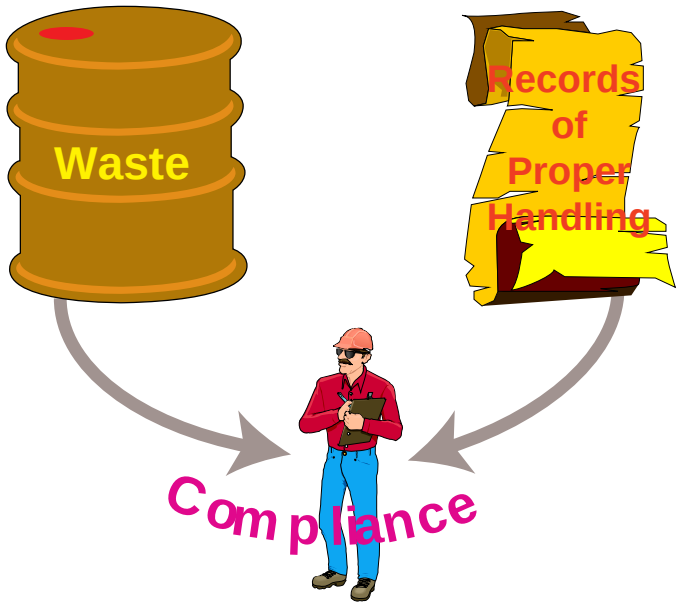


Figure 1 *The Two Parts of Compliance*

A generator of waste is required to fill out a waste disposal requisition before HWM will take possession of the waste. The generator provides information as to the source producing the waste, a chemical and physical description including chemical and/or radiological constituents and the quantity of waste. In addition, the generator provides data regarding the container enclosing the waste, the hazardous waste labeling of the container, the container location and other administrative information.

The Total Waste Management System is the "cradle-to-grave" tracking system that facilitates the fulfillment of LLNL's records, reporting, and information compliance responsibilities as well as assisting in strategic and tactical waste management planning. The aggregate of required information to TWMS is provided in two parts, manual data entry of waste disposal requisitions coupled with the Waste Inventory System (WIS), a transaction based field data application implemented through bar code scanners. WIS is a functional sub-system of TWMS and serves as the introduction point for most physical waste handling information.

Waste Inventory System

The Hazardous Waste Management (HWM) Waste Inventory System (WIS) is the "point-of-action" system and the information link between the waste and records of proper handling. WIS serves as the "front-end" to TWMS, the LLNL Regulatory Compliance Waste Information System.

WIS provides the following capabilities:

- Collection of information concerning waste container transactions as they are performed
- Printing of a wide variety of bar code labels
- Providing HWM Waste Operations staff the ability to track status of waste containers in the storage area
- Serving as the primary source of container tracking information to the Total Waste Management System (TWMS) database

Using an automated design, WIS replaces the paper previously used for recording waste transactions, manual entry of information, and the manual recording of physical inventories.

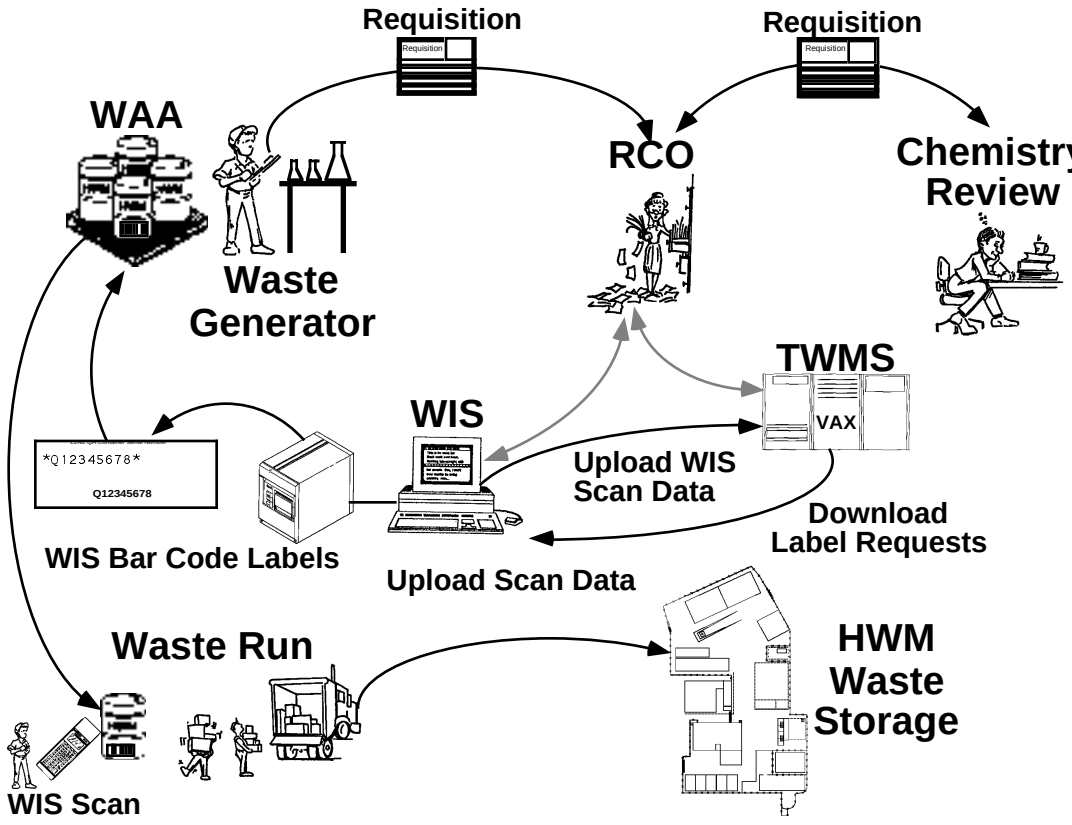


Figure 2 *WIS Relationships to HWM Waste Receival Operations*

Generators submit Waste Disposal Requisitions to HWM for review and approval. After approval, the Requisition Control Office (RCO) uses WIS to print container bar code labels that get issued with the approved requisition. The labels are affixed to the container as part of pre-waste-run activities.

During the waste run, technicians collect container information using WIS Scanners by entering various transaction codes and scanning the bar code label of the container being transferred to the HWM yard. Technicians in HWM receiving areas use WIS Scanners to record waste arrival at HWM and its storage in the appropriate area. After receival of new waste containers, technicians perform a number of operations in the course of processing and disposing of the waste.

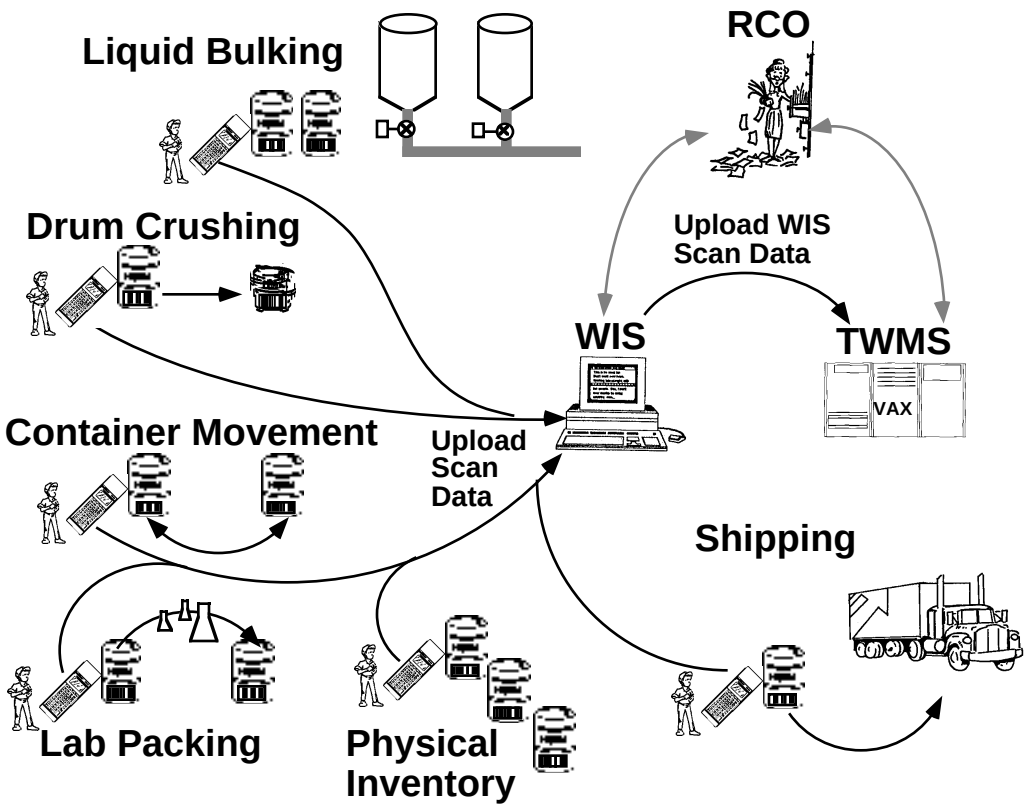


Figure 3 *Typical Operations Tracked by WIS*

Scanner information is uploaded by RCO using the WIS Workstation. At the end of each day, that day's container transactions are transferred to the TWMS database.

The WIS design employs a number of features to increase the assurance of highest data quality:

- Bar-coded container identifiers avoid hand-keying mistakes.
- Non-scanned identifiers are keyed *twice.*
- Pick-lists in Scanner and Workstation avoid free-form entry.
- Scanner and Workstation data entries are validated.
- Uploaded Scanner information is archived in "raw" form to mirrored disk drives.

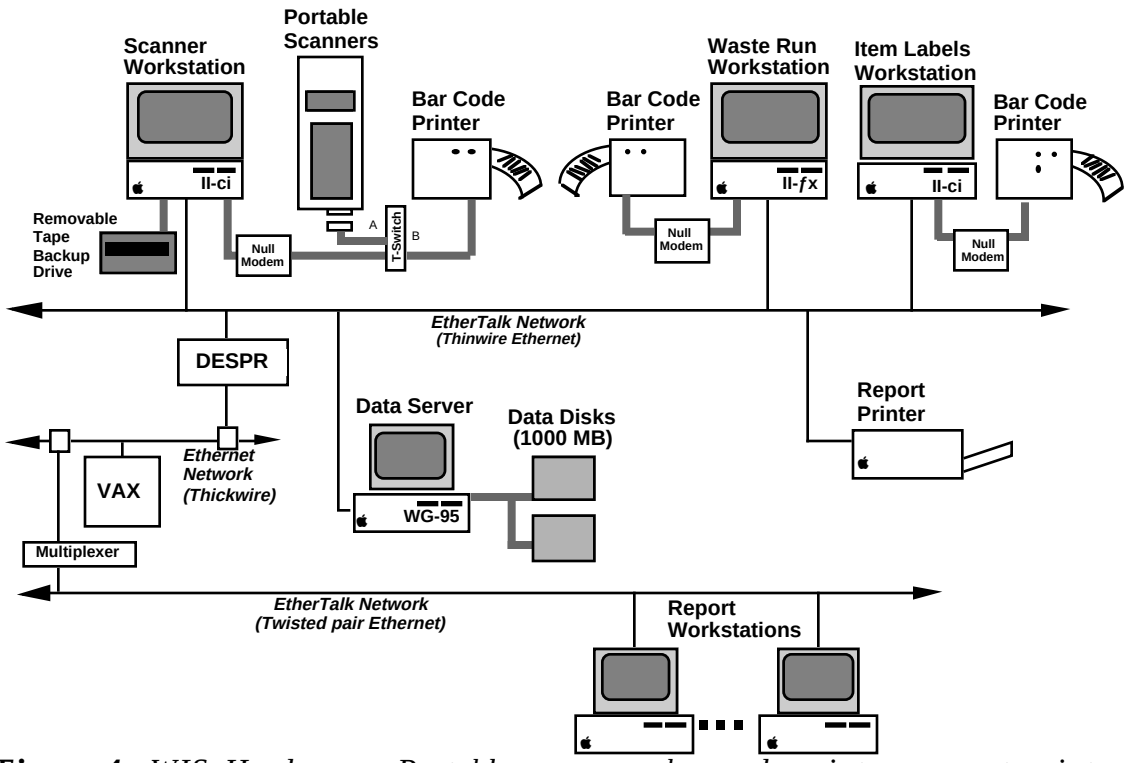
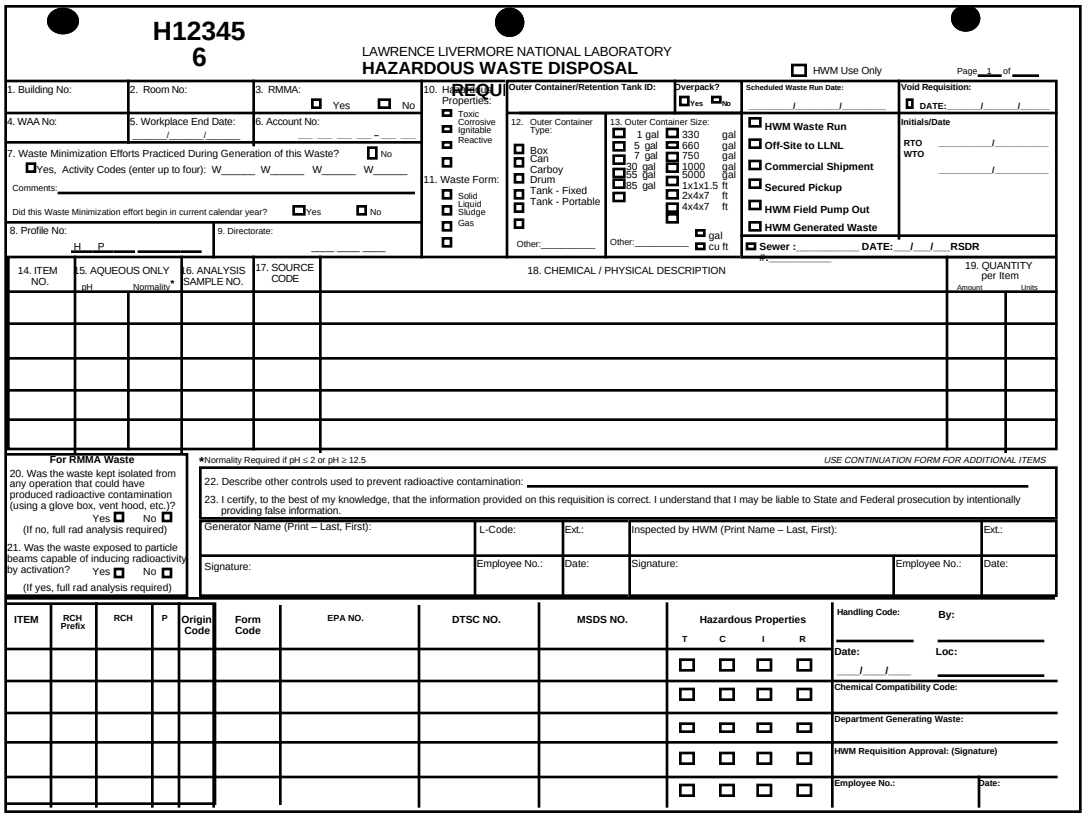


Figure 4 *WIS Hardware: Portable scanners, bar code printers, report printers, workstation computers, a database server, and a network*

TWMS

"Cradle to grave" tracking of waste begins when a generator forwards a requisition to HWM for review and approval. The requisition number is entered into the Total Waste Management System (TWMS) database to begin monitoring the custodian of the requisition as it circulates through the review process. Other pertinent data such as the waste generation date, the location, and the size of the container are entered into TWMS. This helps HWM keep track of the generator's ninety day clock for moving the waste from their Waste Accumulation Area (WAA) and monitoring LLNL's fifty thousand gallon aggregate limit for storage of wastes at its 52 WAAs. A chemist reviews the requisition to determine if the information provided is sufficient to characterize the waste. If so, the chemist characterizes the waste according to its regulatory attributes as well as provides information relevant for safe handling and storage. If not, the chemist either requests more information from the generator or specifies a sample and analyses.



H12345
6

LAWRENCE LIVERMORE NATIONAL LABORATORY
HAZARDOUS WASTE DISPOSAL REQUI

HWM Use Only

Page 1 of

1. Building No:
2. Room No:
3. RMMA: Yes No
4. WAA No:
5. Workplace End Date: ___/___/___
6. Account No:
7. Waste Minimization Efforts Practiced During Generation of this Waste? No
Yes, Activity Codes (enter up to four): W_____ W_____ W_____ W_____
Comments:
Did this Waste Minimization effort begin in current calendar year? Yes No
8. Profile No: H___P___
9. Directorate:
10. Hazard Properties: Toxic, Corrosive, Ignitable, Reactive
11. Waste Form: Solid, Liquid, Sludge, Gas
Outer Container/Retention Tank ID:
Overpack? Yes No
12. Outer Container Type: Box, Can, Carboy, Drum, Tank - Fixed, Tank - Portable, Other:_____
13. Outer Container Size: 1 gal, 5 gal, 7 gal, 30 gal, 55 gal, 85 gal, 330 gal, 660 gal, 750 gal, 1000 gal, 5000 gal, 1x1x1.5 ft, 2x4x7 ft, 4x4x7 ft, Other:_____ gal, cu ft
Scheduled Waste Run Date: ___/___/___
Void Requisition: DATE: ___/___/___
HWM Waste Run
Off-Site to LLNL
Commercial Shipment
Secured Pickup
HWM Field Pump Out
HWM Generated Waste
Initials/Date
RTO ___/___
WTO ___/___
Sewer :_____ DATE: ___/___/___ RSDR
#:_____

14. ITEM NO.	15. AQUEOUS ONLY pH	Normality*	16. ANALYSIS SAMPLE NO.	17. SOURCE CODE	18. CHEMICAL / PHYSICAL DESCRIPTION	19. QUANTITY per Item Amount	Units

*Normality Required if pH ≤ 2 or pH ≥ 12.5

USE CONTINUATION FORM FOR ADDITIONAL ITEMS

For RMMA Waste

20. Was the waste kept isolated from any operation that could have produced radioactive contamination (using a glove box, vent hood, etc.)? Yes No
(If no, full rad analysis required)

21. Was the waste exposed to particle beams capable of inducing radioactivity by activation? Yes No
(If yes, full rad analysis required)

22. Describe other controls used to prevent radioactive contamination: _____

23. I certify, to the best of my knowledge, that the information provided on this requisition is correct. I understand that I may be liable to State and Federal prosecution by intentionally providing false information.

Generator Name (Print – Last, First):	L-Code:	Ext.:	Inspected by HWM (Print Name – Last, First):	Ext.:
Signature:	Employee No.:	Date:	Signature:	Employee No.:	Date:

ITEM	RCH Prefix	RCH	P	Origin Code	Form Code	EPA NO.	DTSC NO.	MSDS NO.	Hazardous Properties T	C	I	R

Handling Code: By:
Date: ___/___/___ Loc:
Chemical Compatibility Code:
Department Generating Waste:
HWM Requisition Approval: (Signature)
Employee No.: Date:

Figure 5 *An LLNL internal waste disposal requisition is used for submission of waste information*

Once the chemist has approved the requisition, the waste characterization, including RCRA and state waste codes, and chemical compatibility are entered into TWMS. If a sample analysis or Material Safety Data Sheet (MSDS) information is used to characterize a waste item then a document reference number is recorded. During database requisition entry, TWMS enforces certain required entry fields with most having a set of acceptable values. This capability ensures that the data collected is complete, correct and meaningful.

Waste Operations Control accesses requisition information to determine waste handling and whether it will be shipped directly from the WAA to an off-site Treatment, Storage and Disposal (TSD) facility or brought into HWM's TSD facility. Movement and disposition of waste within the HWM facility are tracked using WIS. A unique bar-code is issued by TWMS for a given requisition and is to be affixed to the waste container.

At LLNL, a generator is allowed to package multiple waste items within a container. These generator multi-packs are brought into HWM where the container is opened and waste items within are confirmed and then bar-

coded. At this point, waste is no longer associated with a requisition and instead with its container. The association of waste to a requisition is still important for regulatory reporting and waste minimization activities for quantifying sources of generation. However, for handling and disposal, it is more intuitive to associate waste to a container. All waste items handled are assumed to be within a container identified by a bar-code and all transactions involving waste and/or the container are recorded electronically in conjunction with bar-code scanning (WIS). Keeping track of container location and movement allows HWM to determine the location and quantity of waste within the HWM facility at any time. In addition, TWMS tracks combined wastes from the bulking of liquids or consolidation of solids from many containers into a single container. The inverse, splitting waste from a large container into many smaller containers, can also be tracked. TWMS tracks the movement of containers from one into another for repackaging; a process referred to as labpacking.

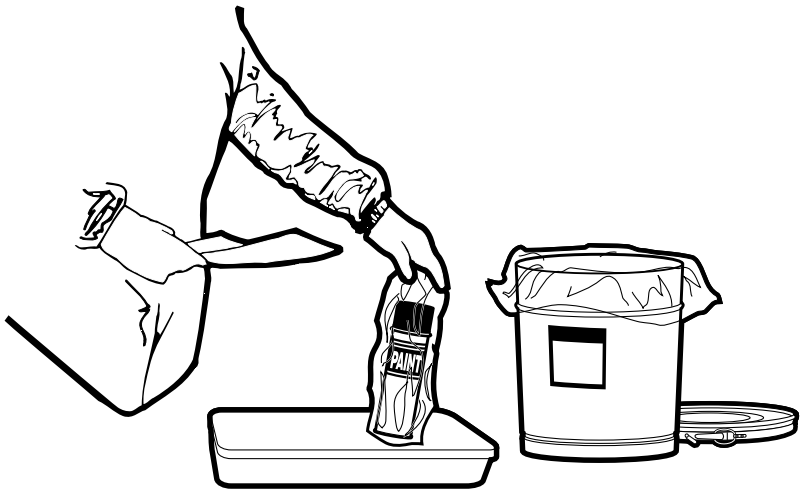


Figure 6 *Labpacking at LLNL: Waste items may be labpacked into a new container*

TWMS provides levels of checking to ensure information integrity. Each transaction is checked to insure correct information is collected by validating each field against acceptable values. Also there are precedence rules for transactions to insure that a transaction is preceded by prerequisite transactions. For example, waste cannot be packed into a new container until the system has been notified that a new container has been brought into service.

Only acceptable transactions are processed by TWMS; unacceptable transactions are placed in a discrepancy log until they are resolved. Each day a report is printed showing transactions that were not acceptable and provides a reason for rejection. TWMS provides reports to alert HWM to conditions

where a transaction was expected and did not occur. For instance, waste may be stored in a staging area for deliveries into or shipments out of HWM's 612 facility for up to 36 hours. A notification report is generated if a container is found to be in the staging area over two days. This feature allows early problem identification while information is still traceable.

Providing easy access and centralized information to HWM facilitates the selection of similar wastes for efficient and cost-effective handling and disposal. This is especially useful for HWM's aqueous treatment facility for the safe bulking of aqueous wastes that adhere to regulatory and emission limits. Once waste is bulked for treatment, the treatment farm can monitor the process in TWMS and when contaminant levels fall below wastewater discharge limits, the waste is discharged to sewer with the transaction recorded in TWMS.

For off-site disposal to a TSDF, having easy access to container waste information allows coordinated shipping and packing operations. The labpacking process is streamlined with TWMS: waste is scanned as it is unpacked and packed into a new labpack. When a labpack is complete, TWMS generates a contents packing list that a chemist reviews before approving the labpack for shipment.

Finally TWMS records the shipment of containers and associates the containers to the shipping manifest. Manifest information is currently hand entered into TWMS to provide a disposition record of a waste container. In the next TWMS development phase, the system will prepare the manifests and provide additional verification.

The benefit of collecting all information within one system is that most data necessary for preparing the EPA Biennial Report is in the database. That information includes, but is not limited to, waste stream information, EPA waste codes, California waste codes, quantities generated, waste amounts shipped off-site for disposition, waste treated on site, and amount discharged to sewer. System applications being developed include electronic file submittal to the EPA and a hard copy to keep in HWM for review. Much of the information to prepare DOE's Integrated Database request for low level waste generation and storage on site is already on the system. In fact, TWMS will minimize the effort required for such reports. In addition, the advantages of centralizing the data will help streamline operations for many years.

Technical Information Department • **Lawrence Livermore National Laboratory**
University of California • Livermore, California 94551